Da-Lee

www.DaLeeGroup.com

350 Jones Road, Stoney Creek, ON Canada L8E 5N2
T 905.643.1135 F 905.643.2299 TF 1.800.268.4490

Calcium Chloride *Market Reviews*

Industrial Uses

11 Petroleum Production

PURPOSE

Calcium chloride ($CaCl_2$) has many uses in establishing and maintaining oil wells. For example, it helps well fluids gain needed consistency, increases density and stabilizes shale formations. As a completion and packer fluid, it seals well casings and displaces drilling mud. In addition, $CaCl_2$ is used as a final processing step to remove haze from petroleum products.

DESCRIPTION

$CaCl_2$ is used in several applications for new or existing wells to improve efficiency and production.

Drilling Muds

Most wells involve rotary drilling and use a drill mud to cool and lubricate the bit and remove cuttings from the hole. The mud needs enough density to overcome formation pressures and keep oil, gas and water in place. Muds are either water or oil based. Calcium chloride is added to the oil-based muds used in deeper wells because, in part, it is inert to clays and shales and it resists solidification under the conditions present in deep wells. In oil-based muds, $CaCl_2$ is part of the brine solution that forms the "internal" phase of an invert emulsion (where an aqueous phase like $CaCl_2$ brine is suspended as droplets in an oil). The oil phase is in contact with the rock formation. Use of $CaCl_2$ allows longer bit life and faster drilling rates (it can reduce drilling times as much as 25%). Calcium chloride is more prevalent in oil-based muds with invert emulsions than sodium chloride because:

- More of it can be dissolved in the internal phase
- It is better at inhibiting clay and shale hydration. A 1% concentration in drilling muds helps prevent hydration and formation damage
- It adds needed weight and gel properties to keep hole cuttings in suspension, so they can be carried from the hole
- It is easily diluted or concentrated
- It does not solidify at high temperatures, so it is effective in deeper wildcat wells

Calcium chloride solutions for invert emulsions weigh 11.0 lb./gal (1.32 kg/L) for 32% $CaCl_2$ to 11.6 lb./gal (1.39 kg/L) for 38% $CaCl_2$. Invert emulsion muds contain 64,000 to 133,000 ppm $CaCl_2$, depending on required weight and gel properties. The $CaCl_2$ must dissolve fully. Flake $CaCl_2$ works better in this application because slower dissolving forms like pellets may settle to the bottom of the mud reservoir and create density problems as they slowly enter the aqueous phase.

Completion Fluids

A completion fluid is used just before the producing formation (oil or gas reservoir) is reached to flush the hole clean of solids so the casing can be cemented into place. The fluid must not deposit a cake on the sides of the hole, which would decrease oil flow.

When an oil-based mud is used for drilling, it is often modified for completion. Water-based mud laden with solids from drilling cannot be modified for use as a completion fluid. A fresh, clear, solids-free brine is used instead. Calcium chloride is an ideal component in such brines because its density range (1.2 to 1.4 kg/l or 10 and 12 lb./gal) is compatible with most wells in use. It also is relatively noncorrosive and stable at the highest bottom-hole temperatures.

350 Jones Road, Stoney Creek, ON Canada L8E 5N2
T 905.643.1135 F 905.643.2299 TF 1.800.268.4490

Concrete Accelerator

The casing is installed after the hole is cleaned with a completion fluid. As a pipe that runs from the reservoir to the surface, it is usually concreted in place to insure a pressure-tight connection to the oil or gas reservoir. The concrete also prevents caving, confines production to the well bore, and provides a way to control well pressure.

A concentration of 2% to 3% $CaCl_2$ is often added as a concrete accelerator, because it dramatically cuts set time (see page, Concrete Accelerator). Calcium chloride can be used down to several thousand feet. Beyond this depth, temperatures may go so high that they cause flash setting, which can plug the casing.

Calcium chloride is used in both primary and secondary concrete work. The first concrete placed behind the casing after it is run into the hole is the "primary job." This restricts fluid movement between producing formations and the surface, and prevents contamination of ground water by fluids from lower zones. It also excludes water from the producing formation and supports the casing. Secondary work involves such activities as plugging a dry hole or plugging back to another producing zone.

Packer Fluids

Once the casing is cemented in place, a smaller diameter pipe, the tubing, is inserted in the casing. Tubing makes the flow of oil or gas more efficient and can be pulled out and replaced if plugs develop or it is damaged. Tubing is used with a packer that keeps well fluids away from the casing to minimize casing corrosion. The tubing-packer combination reduces well pressure on the casing and the chance that a casing leak could become a blowout.

Calcium chloride is excellent for the clear brines often used in packing the annular space between the tubing and casing. It also helps to maintain an optimum pressure level, because it has sufficient density to offset the pressure on the casing and contains no solids. Calcium chloride brine is also an efficient carrier of the plastic packing materials used to consolidate soft or sandy formations near drilling operations.

Workover Fluids

Wells are flushed free of solids with a workover fluid (usually a clear brine) before they are repaired or before reworking a well that has been idle or that has ceased being a producer. Calcium chloride is an ideal component for workover fluids because it has the appropriate density for this application, 10 to 12 lb./gal (1.2 to 1.4 kg/l).

Bit Lubricant

Calcium chloride is used to lubricate bits when hard formations are encountered in the presence of soft water. Used with potassium stearate, it forms a calcium stearate precipitate that lubricates the bit and prevents clay formations from flocculating. This accelerate drilling rates and cuts drill wear. Savings of up to 7 bits per drilled well have been reported.

350 Jones Road, Stoney Creek, ON Canada L8E 5N2
T 905.643.1135 F 905.643.2299 TF 1.800.268.4490

CONTACT:

Da-Lee Group
350 Jones Road
Stoney Creek, ON L8E 5N2

Customer Service: (800) 268-4490
Phone: (905) 643-1135
Fax: (905) 643-2299

Web: www.daleedustcontrol.com
Email: contact@daleegroup.com

Da-Lee Group
491 MacEwan Street
Goderich, ON N7A 3X8

Phone: (519) 524-5903
Fax: (519) 524-5485

Web: www.daleedustcontrol.com
Email: contact@daleegroup.com

Multi Routes Inc
11415 6th Avenue
Montreal, QC H1E 1R8

Phone: (514) 648-2632
Fax: (514) 648-3919

Web: www.multiroutes.com
Email: info@multiroutes.com